

**1 YEAR**  
WARRANTY

CE



# User's Guide

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PATENTED  
LASER CIRCLE  
SIGHTING

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**and OSXL653**  
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**Infrared Thermometer**

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The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

**WARNING:** These products are not designed for use in, and should not be used for, human applications.

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# NOTES:

# 1. Product Introduction

Thank you for purchasing the infrared thermometer. The Infrared Thermometer is non-contact infrared temperature measuring instruments. Features include a 4 digits backlit LCD, scan/hold/auto function and auto power off (6 seconds). To measure a temperature, point the unit at the object, pull the measuring trigger and hold on till the end of shot. Make sure the target area is larger than the unit's optical field of view.

## 1-1 Features

- New series includes high performance, general purpose.
- Emissivity adjustable from 0.1 to 1.00 in 0.01 steps (OSXL653).
- Ultra low power consumption in shutdown mode
- Extended long time measuring reliability.
- Patented laser circle sighting.
- Backlit LCD display.
- °C or °F selectable.
- Electronic trigger lock.
- Temperature data storage (OSXL653).
- Audible alarms (OSXL653).

## 1-2 Applications

- Electrical troubleshooting.
- Automotive repair and maintenance.
- Air conditioner.
- Science experiment.
- Manufacturing processes of semiconductor technology.
- Test terminals on circuits.
- Food safety and processing.
- Perform HVAC energy audits.

## 1-3 Warnings and Cautions

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**CAUTION**

---

You may receive harmful laser radiation exposure if you do not adhere to the warnings listed below:


- **Use of controls or adjustments or performance of procedures other than those specified here may result in hazardous radiation exposure.**
  - **Do not look at the laser beam coming out of the lens or view directly with optical instruments - eye damage can result.**
  - **Use extreme caution when operating the laser sighting.**
  - **Never point the laser beam at a person.**
  - **Do not attempt to open the thermometer. There are no user serviceable parts.**
  - **Keep out of the reach of all children.**
- 

Refer to the inside back cover for product warning label.

## 2. Safety Information

Read the following safety information carefully before attempting to operate or service the meter. Only qualified personnel should perform repairs or servicing not covered in this manual.


### Laser Warning Note!

 Do not aim laser spot directly at human eye, keep it away from the area that children can fetch.

### 2-1 Cautions!

- DO NOT submerge the unit in water.
- This product is not designed for use in medical evaluations. The product can only be used to measure body temperature simply for reference. They are meant for industrial and scientific purposes.

### 2-2 Safety symbols

 Dangerous, refer to this manual before using the meter.

 CE Certification.

This instrument conforms to the following standards:

**EN61326:**Electrical equipment for measurement, control and laboratory use.

**IEC61000-4-2:**Electrostatic discharge immunity test.

**IEC61000-4-3:** Radiated, radio-frequency, electromagnetic field immunity test.

**IEC61000-4-8:** Power frequency magnetic field immunity test.

Tests were conducted using a frequency range of 80-1000MHz with the instrument in three orientations. The average error for the three orientations is  $\pm 0.5^{\circ}\text{C}$  ( $\pm 1.0^{\circ}\text{F}$ ) at 3V/m throughout the spectrum. However, between 781-1000MHz at 3V/m, the instrument may not meet its stated accuracy.

### 3. Specifications

|  |   |
|--|---|
| Distance/Spot Ratio  | 12:1  |
| Temperature Range  | -32 to 538°C (-25 to 1000°F)  |
| Accuracy<br>(Assumes Operation<br>Ambient Temperature<br>of 25°C/77°F) | ±3°C(±5°F)<br>From -32 to -20°C (-25 to -4°F)<br>±2°C(±3°F)<br>From -20 to 100°C (-4 to 212°F)<br>±2% From<br>100 to 538°C (-212 to 1000°F) |
| Thermopile   | 5 to 14 μ m   |
| Repeatability  | ±1 °C (±2 °F)   |
| Resolution   | 0.1 °C (0.1 °F)   |
| Response Time  | 500 ms.   |
| Operation Temp.  | 0 to 50°C (32 to 212°F)<br>10 to 90%RH  |
| Auto Power Off   | Automatically after approx. 6s.   |
| Emissivity   | Adj. 0.1 to 1.0 (OSXL653).<br>0.95 Fixed (OSXL650).   |
| °C/°F Switchable   | YES   |
| Backlight  | YES   |
| Laser Sight Switchable   | YES - Laser Circle  |
| Max//Min/Avg/ΔT  | YES (OSXL653)   |
| Auto-measuring   | YES   |
| Data Storage   | 10 points (OSXL653)   |
| Audible Alarm  | YES (OSXL653)   |
| Battery Type   | 9V(006P, IEC6F22, NEDA1604)   |
| Battery Life   | 16 hrs.   |
| Dimensions   | 170x133x45mm<br>(6.69"x5.23"x1.77")   |
| Weight   | 187g Approx.  |
| Accessory  | 9V Battery, Instruction manual,<br>Carrying case.   |



# 3. Specifications con't.

## Laser Sighting

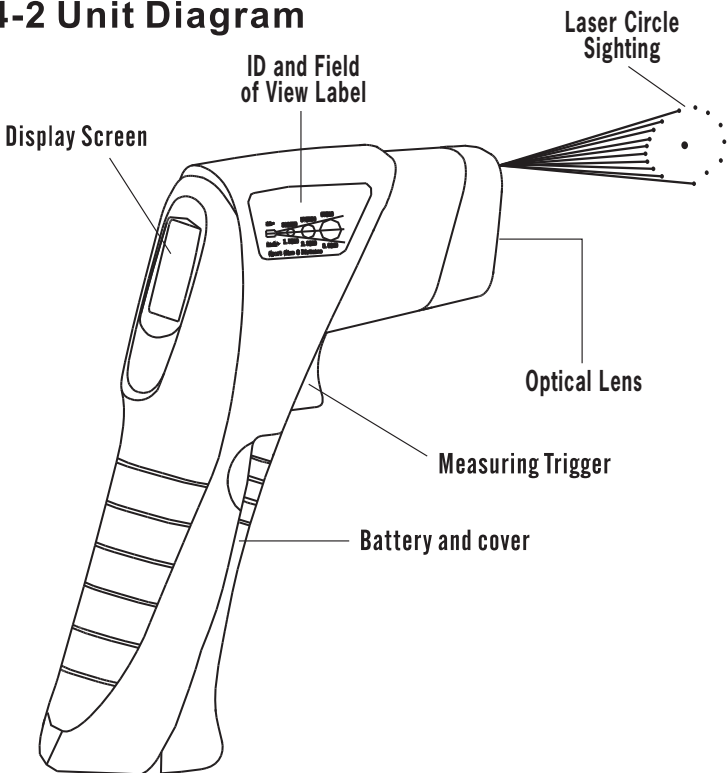
|                                  |   |
|----------------------------------|---|
| Wavelength (Color):              | 630 to 670 nanometers (red)                                 |
| Operating Distance:              | Up to 10 ft.  |
| Max. Output Optical Power:       | <1mW at 75°F ambient temperature,<br>Class II Laser Product |
| European Classification:         | Class 2, EN60825-1  |
| FDA Classification:              | Complies with 21 CFR Chapter 1,<br>Subchapter J             |
| Beam Diameter:                   | 5 mm  |
| Beam Divergence:                 | <2mrad  |
| Laser Configuration:             | Dot and Circle  |
| Power Switch:                    | Slide switch, ON-OFF  |
| Power Indicator:                 | Laser icon on display                                       |
| Power:                           | Supplied by the thermometer                                 |
| Identification Label:            | Located on the right side of the thermometer                |
| Warning and Certification Label: | Located on the left side of the thermometer                 |

# 4. Operation of Instrument

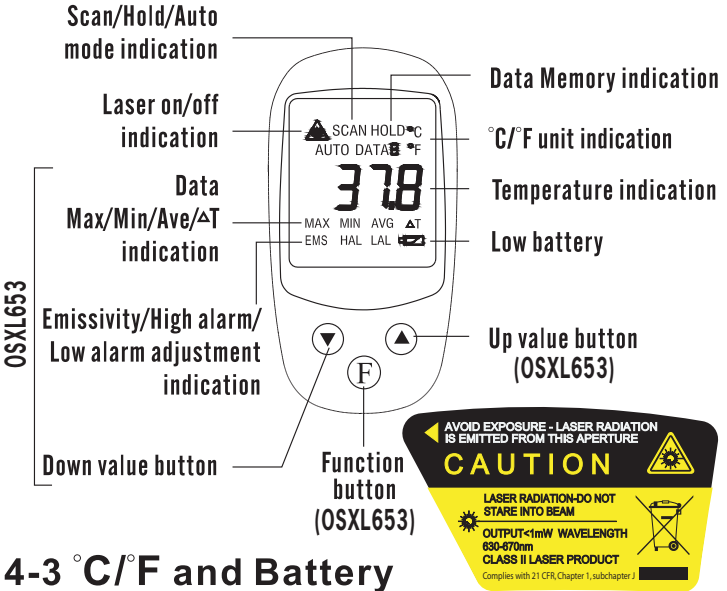
## 4-1 Quick Start

To measure a temperature, point the unit at the target you want to measure, pull the trigger and hold on till the end of shot. In **SCAN** mode, the LCD displays either the current temperature in degree Celsius or Fahrenheit. The unit will **HOLD** the last reading for about 6 seconds after the trigger is released; the word **HOLD** appears. Make sure the target area is larger than the field of view of this instrument. The laser circle sighting indicates the perimeter of the thermometer's field of view. During the measurement session, the display back light stays on.


## 4-2 Unit Diagram



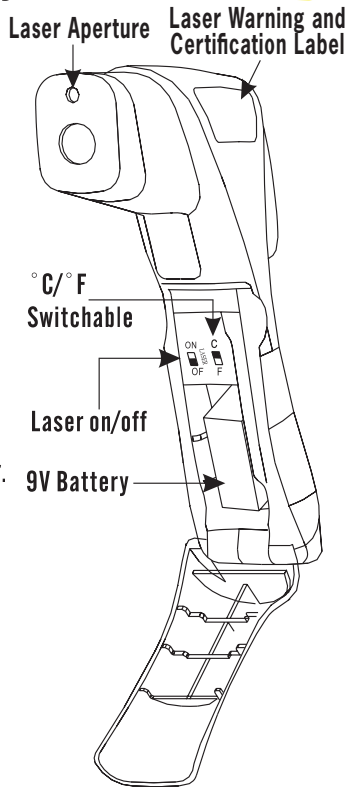
# LCD Display



## 4-3 °C/°F and Battery Change

The unit is powered by 9V battery and displays temperatures in either °C or °F. The user has to replace the battery when the battery voltage is low and battery symbol  appears.

To change the 9V battery, pull open the unit's handle by using the finger. Change the 9V battery with a new one and push the battery cover back.



## 4-4 Advanced Functions (OSXL653)

### 4-4-1 AUTO Mode-Continuous Operation

From the SCAN mode (Trigger is pulled), you can lock the trigger electronically and measure temperature continuously (AUTO mode) by pressing the **F** key. The AUTO icon will appear on the display. Pressing the **F** key again will disable the AUTO mode. AUTO icon will disappear from the display. If the trigger is pulled, the unit stays in the SCAN mode. If the trigger is released, the unit will go to HOLD mode and will shut itself off after about 6 seconds.

The following table shows an overall functional flow chart of the thermometer:

| Mode       | Press F Key             | Press Up Key      | Press Down Key    |
|------------|-------------------------|-------------------|-------------------|
| SCAN       | SCAN → AUTO             | ----              | ----              |
| AUTO       | AUTO → DATA             | ----              | ----              |
| DATA       | DATA → Max Temp         | + Memory Location | - Memory Location |
| Max Temp   | Max Temp → Min Temp     | ----              | ----              |
| Min Temp   | Min Temp → Avg Temp     | ----              | ----              |
| Avg Temp   | Avg Temp → $\Delta T$   | ----              | ----              |
| $\Delta T$ | T → Emissivity          | ----              | ----              |
| Emissivity | Emissivity → High Alarm | + Emissivity      | - Emissivity      |
| HAL        | High Alarm → Low Alarm  | + Alarm Set Point | - Alarm Set Point |
| LAL        | Low Alarm → SCAN/HOLD   | + Alarm Set Point | - Alarm Set Point |

## 4-4-2 Max, Min, Avg, $\Delta T$ Temperatures (OSXL653)

You can review the Maximum, Minimum, Average, and differential (Max - Min) temperatures on the display by pressing the **F** key. If the trigger is pulled at the same time, the display will show SCAN icon and all the values are in real time. If the trigger is released, the display will show the HOLD icon and all the values are the last readings before the trigger is released.

## 4-4-3 Temperature Data Storage & Recall - DATA Mode (OSXL653)

You can store up to 10 temperature data points (Memory Location 0 thru 9). When you are in DATA mode, set the memory location using the Up or Down keys, then pull the trigger. The unit will store the temperature data in the **next memory location**.

You can review (recall) the stored data by going to the DATA mode using the **F** key (Trigger is released) and pressing the UP/Down keys. You can then review memory locations 0 thru 9.

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### NOTE

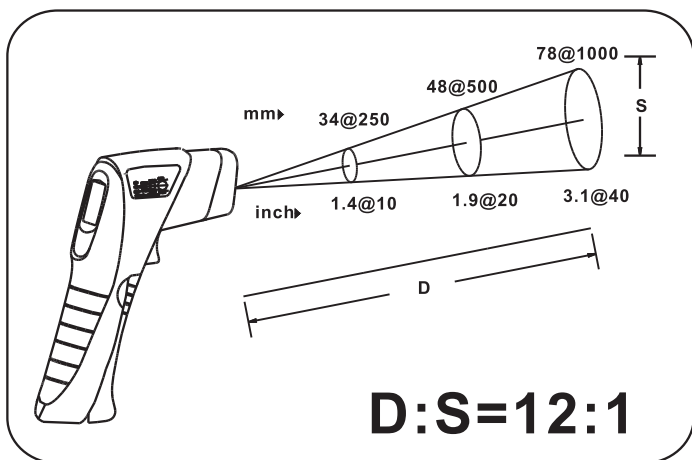
The unit stores all temperature data, Emissivity value, high and low alarm set points in the non-volatile memory, Changing the battery will not affect these values.

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# 5. Techniques Of Infrared Thermometer

## 5-1 Field of view(FOV) ratio =Distance to diameter (DS) ratio

The field of view is the angle of vision at which the instrument operates, and is determined by the optics of the unit. The FOV is the ratio of the distance from the target to the target diameter. When measuring a target temperature, the target area has to be larger than the thermometer field of view (FOV).



## 5-2 Emissivity

Emissivity is the ability of an object to emit or absorb energy. Perfect emitters have an emissivity of 1, emitting 100% of incident energy. An object with an emissivity of 0.8 will absorb 80% and reflect 20% of the incident energy. Emissivity is defined as ratio of the energy radiated by an object at given temperature to the energy emitted by a perfect radiator at the same temperature. All values of emissivity fall between 0.1 and 1.0.

## 6. Maintenance

Cleaning the lens: Blow off loose particles using clean compressed air. Gently brush remaining debris away with a camels hair brush. Carefully wipe the surface with a moist cotton swab. The swab may be moistened with water.

### **NOTE:**

DO NOT use solvents to clean the lens.

### **Cleaning the housing:**

Use soap and water on a damp sponge or soft cloth.

### **PATENT NOTICE:**

U.S. PAT. B1 5,368,392; 5,524,984; 5,727,880; 5,823,678; 5,823,679; 6,123,453; 6,267,500 B1; 6,341,891 B1; 6,377,400 B1; 6,540,398 B2; 6,614,830 B1; 6,633,434 B2; 6,659,639; 6,901,089 B1 / Canada 2,114,806; 2,317,734 / France 2 756 920; 2 767 921; 2 773 213; 2 773 214 / Germany G 94 22 197.9; G 94 22 203.7 / Holland 1007752; / U.K. Registered 2,237,493; 2,320,324; 9726133.3 / EPO 0 644,408 B2; EPO 1085 307 A1.  
Other U.S. and Foreign Patents Pending.

# 7. Emissivity Table

| Material                             | Temp °C/°F          | Emissivity |
|--------------------------------------|---------------------|------------|
| Gold(pure highly polished)           | 227/440             | 0.02       |
| Aluminum foil                        | 27/81               | 0.04       |
| Aluminum disc                        | 27/81               | 0.18       |
| Aluminum household(flat)             | 23/73               | 0.01       |
| Aluminum (polished plate 98.3%)      | 227/400             | 0.04       |
|                                      | 577/1070            | 0.06       |
| Aluminum(rough plate)                | 26/78               | 0.06       |
| Aluminum(oxidized @599°C)            | 199/390             | 0.11       |
|                                      | 599/1110            | 0.19       |
| Aluminum surfaced roofing            | 38/100              | 0.22       |
| Tin(bright tinned iron sheet)        | 25/77               | 0.04       |
| Nickel wire                          | 187/368             | 0.1        |
| Lead(pure 99.95-unoxidized)          | 127/260             | 0.06       |
| Copper                               | 199/390             | 0.18       |
|                                      | 599/1110            | 0.19       |
| Steel                                | 199/390             | 0.52       |
|                                      | 599/1110            | 0.57       |
| Zinc galvanized sheet iron(bright)   | 28/82               | 0.23       |
| Brass(highly polished):              | 247/476             | 0.03       |
| Brass(hard rolled-polished w/lines): | 21/70               | 0.04       |
| Iron galvanized(bright)              | -                   | 0.13       |
| Iron plate(completely)               | 20/68               | 0.69       |
| Rolled sheet steel                   | 21/71               | 0.66       |
| Oxidized iron                        | 100/212             | 0.74       |
| Wrought iron                         | 21/70               | 0.94       |
| Molten iron                          | 1299-1399/3270-2550 | 0.29       |
| Copper(polished)                     | 21-117/70-242       | 0.02       |
| Copper(scraped shiny not mirrored)   | 22/72               | 0.07       |
| Copper(Plate heavily oxidized)       | 25/77               | 0.78       |
| Enamel(white fused on iron)          | 19/66               | 0.9        |
| Formica                              | 27/81               | 0.94       |
| Frozen soil                          | -                   | 0.93       |
| Brick(red-rough)                     | 21/70               | 0.93       |
| Brick(silica-unglazed rough)         | 1000/1832           | 0.8        |
| Carbon(T-carbon 0.9% ash)            | 127/260             | 0.81       |
| Concrete                             | -                   | 0.94       |
| Glass(smooth)                        | 22/72               | 0.94       |
| Granite(polished)                    | 21/70               | 0.85       |
| Ice                                  | 0/32                | 0.97       |
| Marble(light gray polished)          | 22/72               | 0.93       |
| Asbestos board                       | 23/74               | 0.96       |
| Asbestos paper                       | 38/100              | 0.93       |
|                                      | 371/700             | 0.95       |
| Asphalt(paving)                      | 4/39                | 0.97       |



# NOTES:

# NOTES:

## WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

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2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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